

### **Arguments Against Rejection**

Claim 1 is amended. Claims 2, 10, 12, and 20 are cancelled without prejudice. Claims 3, 6, 9, 13, 16, and 19 are amended accordingly. Amendments are supported by original filed specification and claims.

***Claims 1, 2, 6, 7, 11, 12, 16, and 18 are rejected under 35 U.S.C. 103 (a) as being unpatentable over Sarh in view of Baumbick.***

The rejections are traversed.

#### **Argument No. 1**

The present invention provides for the extension of an inner wing segment from an outer wing segment via a coiled actuator. Coiled actuator is comprised of a tube having a fluid therein.

Baumbick describes and claims an actuator having a pair of SMA elements 68A and 68B disposed about a piston 66 so as to move a ram 54. SMA elements 68A and 68B reside within a chamber into which a hot gas is injected to separately heat one of the SMA elements 68A or 68B to achieve the desired displacement of the ram 54. Absolutely nothing in Baumbick suggests SMA elements 68A and 68B are hollow. For example, Baumbick describes passing a hot gas over and across the SMA elements 68A and 68B rather than through the elements: (1) a switch “causes hot gas to flow across SMA element 68A causing extension of the actuator ram 54” (*See Baumbick, column 3, lines 40-41*); and (2) a switch “causes the flow of hot gas over SMA element 68B thereby causing a retraction of actuator ram 54” (*See Baumbick, column 3, lines 44-45*).

Baumbick specifically states that “SMA elements 68A and 68B are preferably of a helical configuration, for example as that taught in U.S. Pat. No. 4,984,542 or of any other suitable configuration or structure.” (*See Baumbick, column 4, lines 15-18*). Patent 4,984,542 clearly

shows a helical spring 24 having a solid cross section. (See FIGS. 3A and 3B).

As such, there is absolutely nothing in Baumbick and Sarh suggesting a hollow coiled tube having a fluid therein so as to contract the coiled tube lengthwise when heated by a fluid and to extend an inner wing segment from an outer wing segment. For this reason alone, the references are not available for citation against any of the claims in this application.

### **Argument No. 2**

Sarh describes a telescopic airfoil composed of threaded and rotatable spars to extend a wing when the spars are rotated. There is absolutely nothing in Baumbick and Sarh suggesting the combination of the non-rotating actuator in Baumbick for the specific purpose of extending a wing segment as in Sarh. For this reason alone, the references are not available for citation against any of the claims in this application.

### **Argument No. 3**

The combination of Baumbick and Sarh is not possible as it would do violence to the present invention.

The present invention provides an extension length approximately equal to the length of the coiled tube in its extended configuration less the length of the coiled tube when contracted. The coiled actuator is comprised of a tube having a fluid therein.

Baumbick describes an actuator having two SMA elements 68A and 68B disposed about a piston 66 having a ram 54 attached thereto and all within a chamber. Piston 66 divides the chamber into two sections. A hot gas fills one section of the chamber so as to heat one SMA element 68A along its exterior and extend the ram 54. A hot gas fills the other section within the chamber so as to heat the other SMA element 68B along its exterior and retract the ram 54. As

such, Baumbick limits displacement of the ram 54 to one-half of the actuator length less the length of one SMA element when contracted.

Applying Baumbick to the present invention limits the length of the inner wing segment extendible from the outer wing segment to less than half the length of the outer wing segment. Whereas, the present invention enables extension of an inner wing segment nearly as long as the outer wing segment. As such, less actuators and wings segments are required with the present invention. For this reason alone, the references are not available for citation against any of the claims in this application.

#### **Argument No. 4**

The combination of Baumbick and Sarh is not possible as it would do violence to the present invention.

The present invention provides an extension length approximately equal to the length of the coiled tube in its extended configuration less the length of the SMA element in its coiled configuration. The coiled actuator is comprised of a tube having a fluid therein.

Baumbick describes an actuator having two SMA elements 68A and 68B disposed about a piston 66 having a ram 54 attached thereto and all within a chamber. Piston 66 divides the chamber into two sections. A hot gas fills one section of the chamber so as to heat one SMA element 68A and extend the ram 54. A hot gas fills the other section of the chamber so as to heat the other SMA element 68B and retract the ram 54.

Unlike Baumbick which provides for a heated gas within the chamber so as to interact and heat the exterior of the SMA elements 68A or 68B, the present invention provides heating of the coiled tube actuator from within.

The present invention minimizes the quantity of fluid required to heat the coiled tube and in doing so provides more uniform and efficient heating thereof.

Application of Baumbick to the present invention would require the heated gas to be provided within the interior volume of at least the inner wing segment. A larger volume of gas would be required by Baumbick than required with the present invention.

Furthermore, leakage from the wing coupled with conduction cooling through the wing would introduce temperature variations frustrating uniform heating along the coiled tube.

For this reason alone, the references are not available for citation against any of the claims in this application.

For the reasons stated above, it is respectfully submitted that the Section 103 rejections are misplaced, and reconsideration and withdrawal of the same are respectfully requested.

***Claims 3-5, 8, 13-15, and 18 are rejected under 35 U.S.C. 103 (a) as being unpatentable over Sarh and Baumbick in view of Villhard.***

The rejections are traversed.

Arguments 1-4 above are incorporated by reference alone and in combination with arguments 5-7, below.

#### **Argument No. 5**

Villhard describes and claims a blade having coolant channels lined with a shape memory alloy so as to resist the onset of vibrations within the blade. (*See Villhard, Abstract*). Blades include rotor blades and stationary vanes employed within compressors and turbines in turbomachinery. (*See Villhard, column 1, lines 7-25*). The blade is fabricated to enhance the load transfer path by direct contact between channel wall and liner. The SMA liner is secured within

the channel to the channel wall via a roughened exterior, a groove arrangement or a compression fit. (See *Villhard*, column 9, lines 35-56). The SMA changes shape and size which absorbs energy from the vibrating blade and converts it to heat, thereby damping vibrations. (See *Villhard*, column 7, lines 32-35).

It is clear that the Examiner is using the present invention as a road map in combining pieces of Villhard and Baumbick and Sarh, which is proscribed in patent law. There must have been something in the references having suggested their mutual combination. Nothing in Villhard even remotely suggests its combination with the telescopic wing in Sarh and the micro-actuator in Baumbick. Likewise, nothing in Baumbick and Sarh even remotely suggests combination with the SMA-based vibration damping system in Villhard. As such, the references do not suggest their mutual combination, therefore the references are not available for combination in the 103 rejection proposed by the Examiner.

#### **Argument No. 6**

The combination of Baumbick and Sarh and Villhard is not possible as it would do violence to the present invention.

The present invention provides a coiled tube composed of shape memory alloy (SMA) having a fluid passing there through that contracts to move a wing segment when the fluid heats the tube. Villhard clearly teaches an SMA tube adhered to the wall of a channel within a blade. Villhard explicitly constrains movement of the SMA tube. Villhard precludes the free moving coiled tube in the present invention.

The piecemeal combination of the closed loop cooling system in Villhard with the micro-actuator of Baumbick and the telescopic wing of Sarh could not be obvious to one skilled in the

art in light of the fixed liner in Villhard.

**Argument No. 7**

Villhard is non-analogous art and therefore its combination could not be obvious to one skilled in the art.

The determination that a reference is from non-analogous art includes: (1) whether the reference is within the field of the inventor's endeavor; and (2) whether the reference is reasonably pertinent to the particular problem with which the inventor was involved. *In re Wood*, 599 F.2d 1032, 202 USPQ 171 (CCPA 1979). The art pertinent to a machine has not been defined so broadly as to require universal knowledge of the applications of known mechanical components. (See *Copeman Labs. Co. v. General Plastics Corp*, 65 USPQ 550, 149 F.2d 962 (7<sup>th</sup> Cir. 1945) (regarding patent on flexible plastic ice cube trays, pertinent art including making of ice trays, plastic trays for forming chocolate candies deemed non-analogous art)).

Villhard describes a blade having an active damping system and is found in Class 416, identified as Fluid Reaction Surfaces. The present invention is a telescopic wing system in Class 244, identified as Aeronautics. As such, Villhard is not and could not be within the inventor's endeavor. There is no logical relationship between the two classes. Furthermore, the active damping system of Villhard is not within a field reasonably pertinent to the present invention, since Villhard has absolutely nothing to do with the wing system described and claimed in the present invention.

Examiner's reason for their combination, namely, the mere substitution of known activation means to perform the same function, provides an overly broad scope of analogous art so as to include non-analogous art including Villhard. Furthermore, the function of Villhard is to

cool a blade within a turbine. Whereas, the function of the present invention is heating to effect the extension of a wing segment. Therefore, Villhard is not available for citation against the claims.

For the reasons stated herein, it is respectfully submitted that the Section 103(a) rejections are misplaced, and reconsideration and withdrawal of the same are respectfully requested.

***Claims 9, 10, 19, and 20 are rejected under 35 U.S.C. 103 (a) as being unpatentable over Sarh and Baumbick in view of Schleppenbach et al.***

The rejections are traversed.

Arguments 1-4 above are incorporated by reference alone and in combination with arguments 8-10, below.

**Argument No. 8**

The combination of Baumbick and Sarh and Schleppenbach is not possible as it would do violence to the present invention.

The present invention provides a coiled tube composed of shape memory alloy (SMA) having a fluid passing there through that contracts to move a wing segment when the fluid heats the tube. Schleppenbach clearly teaches a spring composed of SMA wire. The present invention provides for heating of the coiled tube actuator from within by the fluid. The present invention minimizes the quantity of fluid required to heat the coiled tube and in doing so provides for more uniform and efficient heating. A larger volume of gas would be required than with the present invention. Furthermore, leakage from the wing coupled with conduction cooling through the wing would introduce temperature variations that frustrating uniform heating along the coiled tube.

The structure of the SMA spring in Schleppenbach, namely, a wire, requires it to be

heated within a contained environment, as described by Baumbick. The telescopic wing precludes a contained environment.

The piecemeal combination of the closed loop cooling system in Schleppenbach with the micro-actuator of Baumbick and the telescopic wing of Sarh could not be obvious to one skilled in the art.

#### **Argument No. 9**

Schleppenbach describes and claims an apparatus for imparting tactile information to visually impaired persons. (*See Schleppenbach, column 1, lines 8-11*). The apparatus includes a spring composed of shape memory alloy heated by an electrical power supply so as to activate the spring and move a pin. (*See Schleppenbach, column 1, lines 46-61*). The SMA spring is fabricated from wire. (*See Schleppenbach, column 5, lines 14-20*). Schleppenbach's spring is not the hollow coiled tube of the present invention.

It is clear that the Examiner is using the present invention as a road map in combining pieces of Schleppenbach and Baumbick and Sarh, which is proscribed in patent law. There must have been something in the references having suggested their mutual combination. Nothing in Schleppenbach even remotely suggests its combination with the telescopic wing in Sarh and the micro-actuator in Baumbick. Likewise, nothing in Baumbick and Sarh even remotely suggests combination with the electrical heated spring used to communicate information to the visually impaired as taught by Schleppenbach.

The piecemeal combination of the electrically heated wire spring from Schleppenbach with the micro-actuator of Baumbick and the telescopic wing of Sarh could not be obvious to one skilled in the art. As such, the references do not suggest their mutual combination, therefore the



references are not available for combination in the 103 rejection proposed by the Examiner.

#### **Argument No. 10**

Schleppenbach is non-analogous art and therefore its combination could not be obvious to one skilled in the art.

The determination that a reference is from non-analogous art includes: (1) whether the reference is within the field of the inventor's endeavor; and (2) whether the reference is reasonably pertinent to the particular problem with which the inventor was involved. *In re Wood*, 599 F.2d 1032, 202 USPQ 171 (CCPA 1979). The art pertinent to a machine has not been defined so broadly as to require universal knowledge of the applications of known mechanical components. (See *Copeman Labs. Co. v. General Plastics Corp*, 65 U.S.P.Q. 550, 149 F.2d 962 (7<sup>th</sup> Cir. 1945) (regarding patent on flexible plastic ice cube trays, pertinent art including making of ice trays, plastic trays for forming chocolate candies deemed non-analogous art)).

Schleppenbach describes a device to communicate tactile information, namely, braille, to a visually impair person and is found in Class 434, identified as Education and Demonstration. The present invention is a telescopic wing system and is found in Class 244, identified as Aeronautics. As such, Schleppenbach is not and could not be within the inventor's endeavor. There is no logical relationship between the two classes. Furthermore, the communication system of Schleppenbach is not within a field reasonably pertinent to the present invention, since Schleppenbach has absolutely nothing to do with the wing system described and claimed in the present invention.

Examiner's reason for their combination, namely, the mere substitution of known activation means to perform the same function, provides an overly broad scope of analogous art

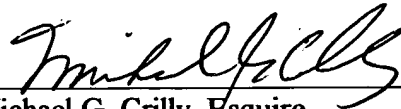
so as to include non-analogous art including Schleppenbach. Furthermore, the function of Schleppenbach is to extend a pin to effect braille. Whereas, the function of the present invention is heating to effect the extension of a wing segment. Therefore, Schleppenbach is not available for citation against the claims.

For the reasons stated herein, it is respectfully submitted that the Section 103(a) rejections are misplaced, and reconsideration and withdrawal of the same are respectfully requested.

**Concluding Remarks**

In view of the above, it is submitted that the amended claims are in condition for allowance. Reconsideration of the rejections is requested. If, after reviewing the above, the Examiner believes any issues remain unresolved, the favor of an Examiner interview is requested and the Examiner is requested to contact the undersigned, by telephone, to schedule the same.

Respectfully submitted,

A handwritten signature in cursive script, appearing to read "Michael G. Crilly", is written over a horizontal line.

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